

August 10, 1955

Dr. John von Neumann  
Atomic Energy Commission  
Washington 25, D.C.

Dear Dr. von Neumann:

Thank you for your comment of the 8th on self-reproduction.

First, I see that I should clarify what I meant by "begging the question", both to you and, by amending the text, to the readers of the article. Although the phrase has logical connotations. I was referring to material content. That is, I suspect that any working model that could be built, actually would have considerable information inherent in the available parts, regardless of the logical possibility of a machine that would be indifferent to its environment. But this is no different from any organism, whose self-sufficiency is also qualified. Or do I misunderstand the sense of information content? If so, what (in a biological context) would be an experimental criterion of self-sufficiency of information?

My suspicion that I do not understand what "information" means is strengthened by reading your argument. It hinges on the word "independent". Am I wrong to think in terms of sets? Then, M and A would overlap; A' could include A. However, your second premise (in the final syllogism) is that "since A' can produce A, the information content of A must be contained in A'. Is this consistent with the condition that A' produce A if [and only if?] A' is immersed in M?

If "information" is construed here as the rule of behavior that A or A' is to follow in a suitable environment, M, is encountered, I see that my objections could be countered. The experimental-biological problem would be deepened, as we can only detect whether a given situation works, and I do not know how we tell whether it is instructions or material that is lacking. In this event, then "biological specificity" would have an even broader content than information, and I would merely substitute the terms in my account. I would also be more discouraged about the possibility of learning something that could be put to good use in the laboratory.

I do not want to impose on your time; whatever you can spare for this might be put down to instruction, which I would be grateful to have.

Yours sincerely,

Joshua Lederberg  
Professor of Genetics